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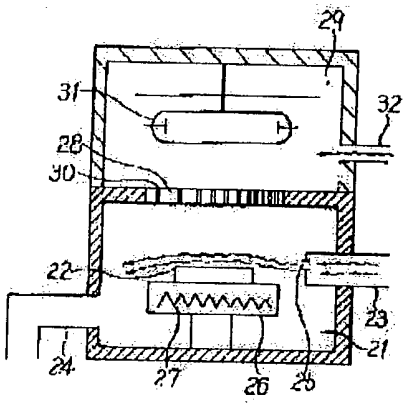
(54) OPTICAL CVD DEVICE

(57)Abstract:
PURPOSE: To provide a compact optical CVD device by which the film thickness distribution in the direction vertical to the flow of reaction gas can be controlled freely and a film can be formed at low cost and which can treat large-diameter substrates.
CONSTITUTION: In a reaction chamber 21 which stores a substrate 22 to be treated, a reaction gas bring-in port 23 and an exhaust port 24 are so installed that reaction gas flows nearly parallel with the surface of the substrate 22 and a light penetrable gas jetting board 27 having a lot of small holes 30 is located between the reaction chamber 21 and a light source chamber 29 and inactive gas which flows in through an inactive gas bring-in port 31 made in the light source chamber 29 is brought in through the small holes 30 from the direction vertical to the surface of the substrate 22. By changing the vertical thickness of the blowout width of a slit-like blowout port 25 formed at an end face of a reaction gas bring-in port 23 in the width direction (horizontal direction), the film thickness distribution in the direction vertical to the flow of the reaction gas is controlled freely.



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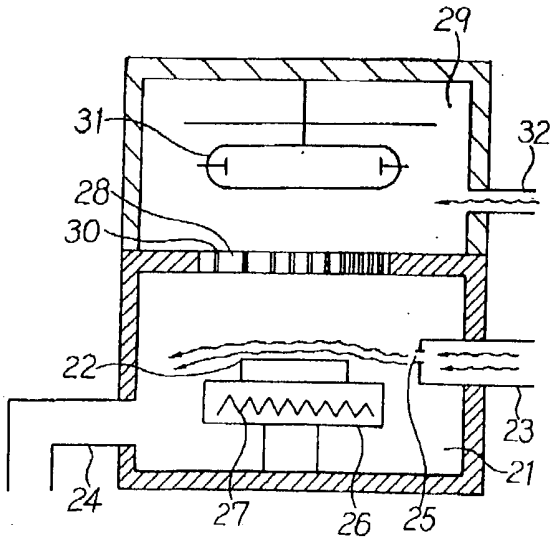
(54)【発明の名称】　光ＣＶＤ装置

(57)【要約】
【目的】　反応ガスの流れに対して垂直方向の膜厚分布を自在にコントロールして、低コストの成膜が可能でコンパクトな大口径基板対応光ＣＶＤ装置をうること。
【構成】　処理すべき基板２２を収容する反応室２１内に、基板２２の表面にほぼ平行に反応ガスが流れるように反応ガス導入口２３と排出口２４を設け、該反応室２１と光源室２９との間に、多数の小孔３０を有する光透過性ガス噴出板２７を配置し、光源室２９に開口する不活性ガス導入口３１より流入する不活性ガスを、該小孔３０を通して基板２２上の表面に対して垂直方向より導入する。上記反応ガス導入口２３の端面に形成されるスリット状の吹出し口２５の吹出し幅の垂直方向の厚みを、幅方向（水平方向）に変化させて、反応ガスの流れに対して垂直方向の膜厚分布を自在にコントロールする。



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【特許請求の範囲】

【請求項１】　基板を収容する反応室と、該反応室内に反応ガスを導入するためのガス導入口及び導入したガスを排気する排気口並びに排気手段と、該反応ガスを光化学反応させ、該基板上に薄膜を形成させるための光源と、該光源を収容する光源室と、該反応室と該光源室の間に、多数の小孔を持った光透過性のガス噴出板を配置し、該反応室内に収容された基板の表面にほぼ平行に該ガス導入口より第１のガス流をシート状に導入し、また該基板上の表面に、この表面に垂直な方向から第２のガス流を、該多数の小孔を持った光透過性のガス噴出板より導入して、該基板の表面の近傍に上記第１のガス流を層流状態に保持するようにした光ＣＶＤ装置において、上記第１のガス導入口の吹出し幅の厚みを可変にしたことを特徴とする光ＣＶＤ装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、半導体や液晶ディスプレイ等の製造に用いられる薄膜形成装置に関する。

【０００２】

【従来の技術】近年、光のエネルギーを用い、シラン、ジシランなどの化合物ガスを分解し、シリコンウエハやガラス基板上に薄膜を形成する、光ＣＶＤ装置の開発が積極的になされている。これら光を用いた光ＣＶＤ装置は、プロセスの低温化が可能であり、荷電粒子による基板や形成膜の劣化も発生しないことから、次世代のデバイス製造方法として大きく注目されている。しかしながら、このような光ＣＶＤ装置においては、反応生成物が光透過窓やランプ表面を汚し、光量が低下するという大きな問題があった。このような問題点に対処するために、例えば、特開昭６０－２０９２４８号公報に示されるように、反応室と光源室とを紫外線透過性の多孔板で仕切り、該多孔板を通して不活性ガスをパージすることにより、光透過窓やランプ表面の汚れを防止する提案がなされている。ところが、このような汚れ防止機構を採用するとパージガスによる希釈効果が発生するため、反応ガス導入口側から排気口側に向って非常に大きな膜厚分布が発生するという問題が新たに発生した。

【０００３】上記の問題に対処するために、本発明者らは、場所により小孔の分布密度を変化させた紫外線透過性の多孔板（ガス噴出板）を用い、ガス吹出し量を場所により変化させることで、±５％程度の比較的良好な膜厚分布を得ることができるようにした光ＣＶＤ装置を開発（発明）した。

【０００４】図６は、上記構成の光ＣＶＤ装置を示す断面図であって、１は処理すべき基板２を収容する反応室であり、反応ガスの導入系及び排気系がそれぞれ導入口３及び排気口４に接続されている。導入口３は、図７に示すように、吹出し口５の厚みａが１ｍｍで、長さ（幅）ｂが２５０ｍｍのスリット状の形状をとってい

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る。反応室１中には、基板２を装着するステージ６が設置され、通常、ヒーター７等により一定温度に制御されている。またこの反応室１は、小孔を多数持った石英製の噴出板８を介して光源室９と接続されている。多数の小孔を持った石英製のガス噴出板８は、図８に示されているように、均一な直径をもった小孔１０がほぼ全面に不均一な密度で分布しており、反応ガスの上流から下流にかけて吹出し量が減少するよう設計されている。一方、光源室９には、光化学反応に好適な波長を放出する光源１１が設置されており、基板２上に光を照射できるようになっている。また、不活性ガスの導入系も導入口１２に接続されている。

【０００５】反応ガスは、反応ガス導入系から導入口３の吹出し口５を経て基板２の表面にほぼ平行にシート状に導入され、好適な波長の光により分解または反応を起こし、該基板２上に薄膜を堆積する。この時、不活性ガス導入口１２より導入した不活性ガスを、小孔１０を多数もった石英製の噴出板８を通して基板２の表面に対向するように反応室１へ導入し、光源１１への膜付着を防止できるよう構成されている。

【０００６】

【発明が解決しようとする課題】上記のように構成した光ＣＶＤ装置を用いることにより、６インチ基板内全領域で±５％の良好な膜厚分布を得ることができるようになった。しかしながら、このような良好な膜厚分布を得るには、基板の直径に対してある長さ以上の吹出し幅を持った反応ガス導入口が必要となる。図９は、６インチ基板を用いた成膜において、基板直径に対し、それぞれ１．１倍、１．３倍、１．６倍の吹出し幅を持ったガス導入口を用いて成膜した時の、流れに垂直方向の膜厚分布を示したものである。図９に見られるように、吹出し幅が小さい場合、基板の周辺部において膜厚が極端に低下している。一方、吹出し幅の増加に伴い、周辺部の膜厚低下が改善されていることがわかる。このことは、吹出し幅から吹出す反応ガスの流れが均一ではなく、吹出し口５の端部で吹出し量が低下しているためのと考えられる。

【０００７】従って、上記のように構成した光ＣＶＤ装置を用いて、大面積基板に均一な膜を堆積しようとすれば、基板直径に対して、最低１．６倍の吹出し幅をもつガス導入口を用いることが必要となる。ところが、このようにすれば、装置作製の観点から装置の大型化や反応ガスの大流量化につながり、ひいては高コスト化を招くことになるという問題点があった。

【０００８】本発明は、上記のような問題点を解決し、コンパクトで低コストの大口径基板対応光ＣＶＤ装置を提供することを目的としている。

【０００９】

【課題を解決するための手段】上記の目的を達成するために、本発明の光ＣＶＤ装置は、処理すべき基板を収容

する反応室と、該反応室内に反応ガスを導入するためのガス導入口及び導入したガスを排気する排気口並びに排気手段と、該反応ガスを光化学反応させ、該基板上に薄膜を形成させるための光源と、該光源を収容する光源室と、該反応室と該光源室の間に、多数の小孔を持った光透過性のガス噴出板を配置し、該反応室内に収容された基板の表面にほぼ平行に該ガス導入口より第1のガス流をシート状に導入し、また該基板上の表面に、この表面に垂直な方向から第2のガス流を、該多数の小孔を持った光透過性のガス噴出板より導入して、該基板の表面の近傍に上記第1のガス流を層流状態に保持するようにした光CVD装置において、上記第1のガス導入口の吹出し幅の厚みを場所により変化させたことを特徴としている。

【0010】

【作用】上記のように構成した本発明の光CVD装置は、ガス導入口の吹出し幅の厚みを場所により変化させ、流れに垂直方向の反応ガスの濃度分布を自在にコントロールすることが可能となるため、比較的小型のガス導入口、具体的には、基板の直径に対して1～1．3倍程度のものを用いることにより、従来の光CVD装置と同程度の膜厚分布を得ることができるようになる。

【0011】

【実施例】次に、本発明の実施例を図面と共に説明する。図1は、本発明の一実施例を示す大口径基板対応の光CVD装置の概略断面図、図2（a）及び（b）は、本実施例で使用した吹出し幅の厚みを場所により変化させた反応ガス導入口の概略斜視図及び該導入口の端面に形成された吹出し口の正面図である。

【0012】図において、21は6インチガラス基板22を収容するアルミ製の反応室であり、反応ガスの導入系及び排気系がそれぞれ導入口23及び排気口24に接続されている。この反応ガス導入口23の端面に形成された吹出し口25は、図2（a）（b）に示すように、幅200mmの長さを持ちほぼ3分割されていて、中心部と両脇で1対2の割り合いで反応ガスを供給できるように構成されている。また反応室21中には、6インチガラス基板22を装着するステージ26が設置され、赤外ランプヒーター27により250℃に制御されている。またこの反応室は、直径0．6mmの小孔を多数持ち、大きさ200mm×300mmで厚さ2mmの石英製の噴出板28を介して光源室29と接続されている。この石英製の噴出板28は、直径0．6mmの小孔30が上流、中流、下流の3つの領域にそれぞれ3対2対1の吹出し量となるように孔数を変化させて形成されている。光源室29には、光化学反応に好適な波長を放出する大面積の低圧水銀ランプ31が設置されており、ガラス基板22上に均一の照度で光を照射できるようになっている。また不活性ガスの導入系も導入口32に接続されている。

【0013】上記のように構成した装置において、反応ガスにシラン及び水銀蒸気、不活性ガスにアルゴンガスを用いて、6インチサイズのガラス基板22にアモルファスシリコン膜を堆積させ膜厚分布を測定した。結果を図5に示す。この図の○印から明らかなように、反応ガス流に垂直方向において総べての領域に亙り±5％以内の良好な膜厚分布が得られていることが分かる。これは基板直径に対して1．6倍以上の吹出し幅を持つ従来型の反応ガス導入口を用いた場合の分布とほぼ一致している。

【0014】上記の実施例では幅200mmのスリットを3分割した形状をとっているが、必ずしもこのような形状をとる必要はなく、図3（a）（b）に示すように、中心から端部にかけて徐々に厚みが増すような形や、図4（a）（b）に示すように、中心部のある領域を塞いでしまい、端部のみを開口した形状のものであってもよい。要は、実験や計算機シュミレーション等を用いて、反応ガスの流れに対して、垂直方向の分布を均一にできるように、中心部と端部の吹出し口の厚みを調節したものであればどのようなものでも可能である。実際、図3及び図4のガス導入口を用いて成膜実験を行なった場合、図5に見られるように、上記実施例とほとんど同様な分布が得られることが分かる。

【0015】

【発明の効果】以上説明したように、本発明によれば、ガス導入口の吹出し幅の厚みを場所により変化させたことにより、反応ガスの流れに対して垂直方向の膜厚分布を自在にコントロールすることができるため、コンパクトで低コストの光CVD装置を得ることができる。

【図面の簡単な説明】

【図1】本発明の一実施例を示す光CVD装置の断面図である。

【図2】本発明の光CVD装置に使用した反応ガス導入口の一実施例を示し、（a）は概略斜視図、（b）は吹出し口の正面図である。

【図3】本発明の光CVD装置に使用した反応ガス導入口の他の実施例を示し、（a）は概略斜視図、（b）は吹出し口の正面図である。

【図4】本発明の光CVD装置に使用した反応ガス導入口の更に他の実施例を示し、（a）は概略斜視図、（b）は吹出し口の正面図である。

【図5】図2ないし図4のガス導入口を用いて行なった成膜の反応ガス流れに垂直方向の膜厚分布特性図である。

【図6】従来例を示す光CVD装置の断面図である。

【図7】図6の反応ガス導入口の斜視図である。

【図8】図6のガス噴出板の模式図である。

【図9】従来型の光CVD装置においてガス導入口の吹出し幅を変えた時に得られた膜厚分布特性図である。

【符号の説明】

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21　反応室
22　ガラス基板
23　反応ガス導入口
24　排気口
25　吹出し口
26　ステージ

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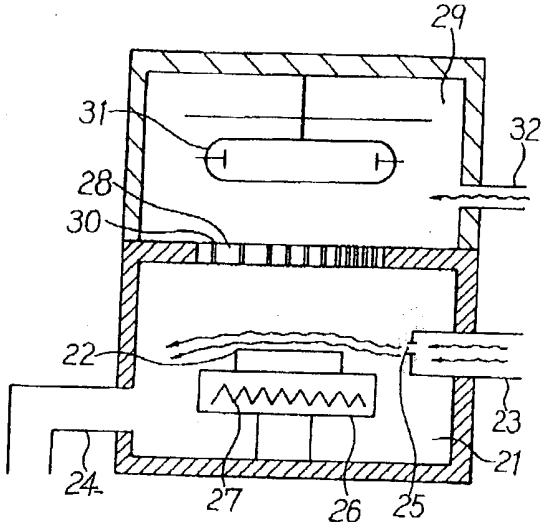
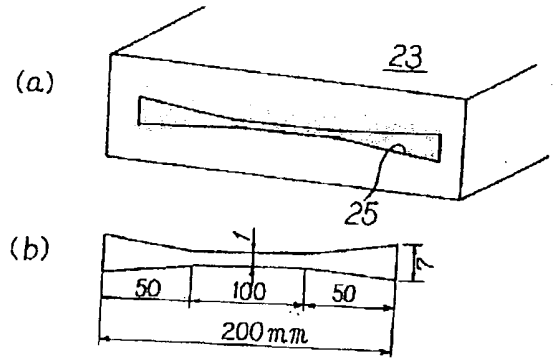
27　赤外ランプヒータ
28　石英製噴出板
29　光源室
30　小孔
31　低圧水銀ランプ
32　不活性ガス導入口

【図1】

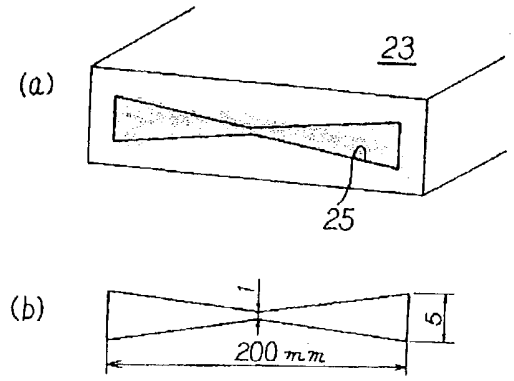


【図2】

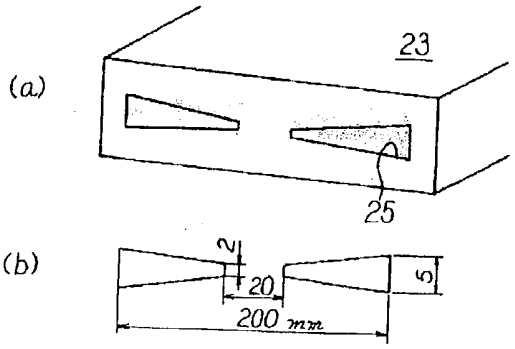


1. NON-uniform distribution
2. Nozzle hole Shape

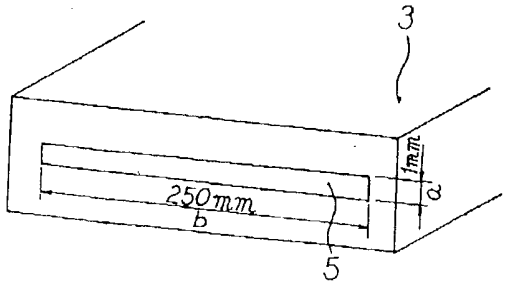
【図3】



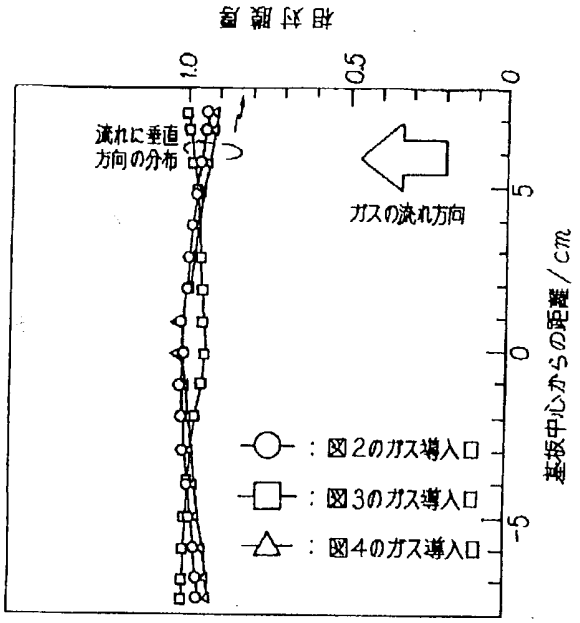
【図4】



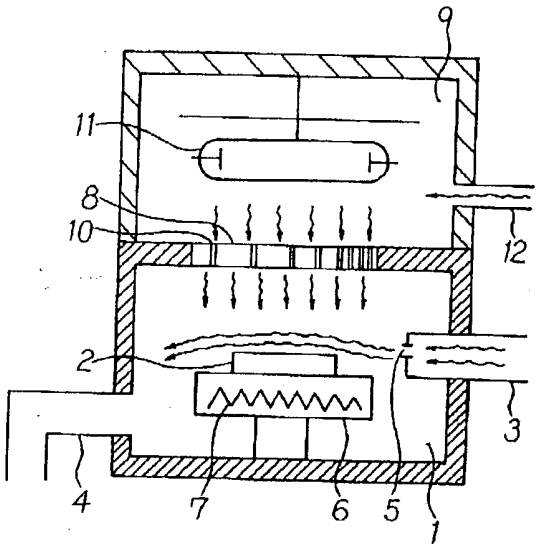
【図7】



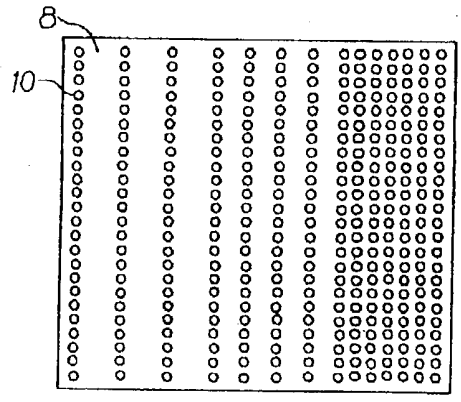
【図5】


相対膜厚
1.0
0.5
0
5
0
-5
基板中心からの距離／cm
流れに垂直
方向の分布
ガスの流れ方向
：図2のガス導入口
：図3のガス導入口
：図4のガス導入口

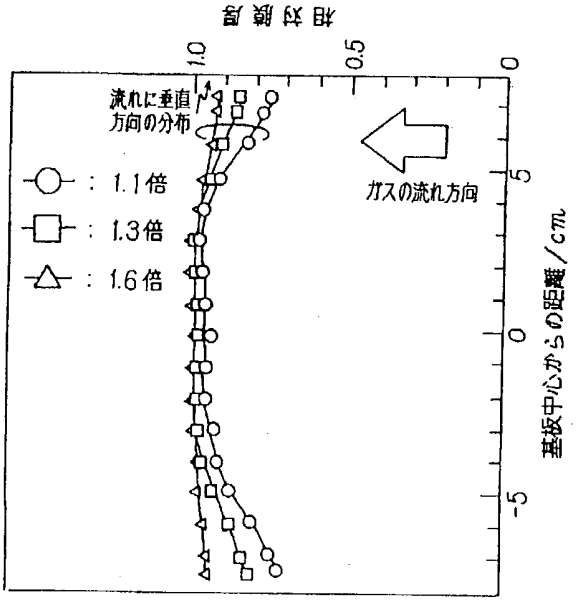
【図6】


9
11
8
10
12
2
3
4
7
6
5
1

【図8】


8
10

【図9】


相対膜厚
1.0
0.5
0
5
0
-5
基板中心からの距離／cm
流れに垂直
方向の分布
ガスの流れ方向
：1.1倍
：1.3倍
：1.6倍

DETAILED DESCRIPTION

[Detailed description]
[0001]
[Field of the Invention] this invention relates to the thin film deposition system used for a manufacture of a semiconductor, a liquid crystal display, etc.
[0002]
[Prior art] In recent years, using the luminous energy, compound gas, such as a silane and a disilane, is decomposed and the development of a photon assisted CVD system which forms a thin film on a silicon wafer or a glass substrate is made positively. Low-temperature-izing of a process is possible for the photon assisted CVD system using these light, and since it does not generate a degradation of the substrate by the charged particle or a formation layer, either, it attracts attention greatly as the device manufacture technique of the next generation. However, in such a photon assisted CVD system, the resultant soiled the light-transmission aperture and the lamp front face, and there was a big problem that the quantity of light fell. In order to cope with such a trouble, as it is shown in a Provisional-Publication-No. 209248 [60 to] official report, a reaction chamber and a light source room are divided with the perforated plate of a diactinism, and the proposal which prevents the dirt on a light-transmission aperture or the front face of a lamp is made by purging inert gas through this perforated plate. However, since the dilution effect by purge gas would occur if such a dirt prevention device is adopted, the problem that a very big thickness distribution occurred toward an exhaust-port side from a reactant gas introduction opening side newly occurred.
[0003] In order to cope with the above-mentioned problem, this invention persons developed the photon assisted CVD system which enabled it to obtain about **5% of a comparatively good thickness distribution by changing the amount of gas blow off by the location using the perforated plate (blow-of-gas plate) of a diactinism to which the distribution density of a stoma was changed by the location (invention).
[0004] Drawing 6 is the cross section showing the photon assisted CVD system of the above-mentioned configuration, 1 is a reaction chamber in which the substrate 2 which should be processed is held, and the introductory system and exhaust air system of reactant gas are connected to the introductory opening 3 and the exhaust port 4, respectively. Thickness a of an exit cone 5 is 1mm, and the introductory opening 3 has taken the slit-like configuration where length (width of face) b is 250mm, as shown in drawing 7 . All over a reaction chamber 1, the stage 6 equipped with a substrate 2 is installed, and it is usually controlled by the heater 7 etc. by constant temperature. Moreover, this reaction chamber 1 is connected with the light source room 9 through the jet plate 8 made from a quartz with many stomas. The blow-of-gas plate 8 made from a quartz with many stomas is designed so that it is mostly distributed over the whole surface by the uneven density, and the stoma 10 with the uniform diameter may apply down-stream, and may blow off from the upstream of reactant gas and an amount may decrease as shown in drawing 8 . On the other hand, the light source 11 which emits the suitable wavelength for photochemical reaction is installed in the light source room 9, and light can be irradiated now on a substrate 2. Moreover, the introductory system of inert gas is also connected to the introductory opening 12.
[0005] Reactant gas is introduced in the shape of a sheet almost in parallel with the front face of a substrate 2 through the exit cone 5 of the introductory opening 3 from a reactant gas introduction system, causes decomposition or a reaction by the light of suitable wavelength, and deposits a thin film on this substrate 2. At this time, the inert gas introduced from the inert gas introduction opening 12 is introduced to a reaction chamber 1 so that the front face of a substrate 2 may be countered through the jet plate 8 made from a quartz with many stomas 10, and it is constituted so that layer adhesion in the light source 11 can be prevented.
[0006]
[Object of the Invention] By using the photon assisted CVD system constituted as mentioned above, **5% of a good thickness distribution can be obtained now in the all field in a 6 inch substrate. However, in order to obtain such a good thickness distribution, the reactant gas introduction opening with the blow-off width of face more than the length to which the diameter of a substrate is received is needed. Drawing 9 shows a vertical thickness distribution to flowing when ****ing to a substrate diameter using the gas inlet which had one 1.6 times [1.1 times, 1.3 times, and] the blow-off width of face of this, respectively in **** which used the 6 inch substrate. In the circumference section of a substrate, the thickness is falling [blow-off width of face] extremely the parvus case so that drawing 9 may see. On the other hand, in connection with the increase in blow-off width of face, it turns out that the thickness fall of the circumference section is improved. Since flowing of the reactant gas which blows off from blow-off width of face blows off at the edge of an exit cone 5 rather than is uniform and the amount is falling, this is considered.

[0007] Therefore, if it is going to deposit a uniform layer on a large area substrate using the photon assisted CVD system constituted as mentioned above, it is necessary to use the gas inlet with one a minimum of 1.6 times the blow-off width of face of this to a substrate diameter. However, when doing in this way, there was a trouble where would lead to large-sized-izing of equipment or large flow rate-ization of reactant gas from the viewpoint of equipment production, as a result high cost-ization would be caused.
[0008] this invention solves the above troubles, and it is compact and it aims at offering the diameter substrate correspondence photon assisted CVD system of the macrostomia of a low cost.
[0009]
[The means for solving a technical problem] In order to attain the above-mentioned purpose, the photon assisted CVD system of this invention The exhaust port and the exhaust air means of exhausting the gas inlet and the introduced gas for introducing reactant gas in the reaction chamber in which the substrate which should be processed is held, and this reaction chamber, Between the light source room in which the light source and this light source for carrying out photochemical reaction of this reactant gas, and making a thin film form on this substrate are held, and this reaction chamber and this light source room Arrange the blow-of-gas plate of light-transmission nature with many stomas, and the 1st gas style is introduced in the shape of a sheet from this gas inlet almost in parallel with the front face of the substrate held in this reaction chamber. Moreover, the 2nd gas style is introduced into the front face on this substrate from orientation perpendicular to this front face from the blow-of-gas plate of light-transmission nature with the stoma of these masses. In the photon assisted CVD system which held the gas style of the above 1st in the laminar-flow status near the front face of this substrate, it is characterized by changing the thickness of the blow-off width of face of the 1st above-mentioned gas inlet by the location.
[0010]
[Operation] The photon assisted CVD system of this invention constituted as mentioned above changes the thickness of the blow-off width of face of a gas inlet by the location, and since it becomes possible [controlling a concentration distribution of vertical reactant gas free with flowing], specifically, it can obtain a thickness distribution of the same grade as the conventional photon assisted CVD system a comparatively small gas inlet and by using an about 1 to 1.3-time thing to the diameter of a substrate.
[0011]
[Example] Next, the example of this invention is explained with a drawing. The outline cross section of the photon assisted CVD system of the diameter substrate correspondence of the macrostomia in which drawing 1 shows one example of this invention, drawing 2 (a), and (b) are the front view of the exit cone formed in the outline perspective diagram of the reactant gas introduction opening to which it blew off and the thickness of width of face was changed by the location and this introductory gossip side which were used by this example.
[0012] In drawing, 21 is a reaction chamber made from aluminum in which the 6 inch glass substrate 22 is held, and the introductory system and exhaust air system of reactant gas are connected to the introductory opening 23 and the exhaust port 24, respectively. As shown in drawing 2 (a) and (b), about 3 ****s of the exit cones 25 formed in the end face of this reactant gas introduction opening 23 are carried out with the length with a width of face of 200mm, and they are constituted so that reactant gas can be supplied at a rate of 1 to 2 by the core and both the sides. Moreover, all over a reaction chamber 21, the stage 26 equipped with the 6 inch glass substrate 22 is installed, and it is controlled by the infrared-lamp heater 27 by 250 degrees C. Moreover, this reaction chamber has many stomas with a diameter of 0.6mm, and is connected with the light source room 29 through the jet plate 28 with a thickness of 2mm made from a quartz by size 200mmx300mm. as for the jet plate 28 made from this quartz, the stoma 30 with a diameter of 0.6mm serves as the amount of blow off of 3 to 2 to 1, respectively to three fields, the upstream, a middle class, and a lower stream of a river, -- as -- a hole -- a number is changed and it is formed The low-pressure mercury lamp 31 of the large area which emits the suitable wavelength for photochemical reaction is installed in the light source room 29, and light can be irradiated now with a uniform illuminance on a glass substrate 22. Moreover, the introductory system of inert gas is also connected to the introductory opening 32.
[0013] In the equipment constituted as mentioned above, used the silane and the mercury steam at reactant gas, used argon gas for inert gas, the amorphous silicon layer was made to deposit on the glass substrate 22 of a 6 inch size, and the thickness distribution was measured. A result is shown in drawing 5 . It turns out that the field of the total **** is covered in a perpendicular direction in the style of reactant gas, and less than **5% of the good thickness distribution is obtained so that clearly from O mark of this drawing. This is mostly in agreement with the distribution at the time of using the reactant gas introduction opening of a conventional type which has the blow-off width of face of 1.6 times or more to a substrate diameter.
[0014] Although the configuration which trichotomized the slit with a width of face of 200mm is taken in the above-mentioned example, as it is not necessary to necessarily take such a configuration and it is shown in drawing 3 (a) and (b), you may be the thing of the configuration which took up type whose thickness is missing from an edge from a center and increases gradually, and the field which has a core as shown in drawing 4 (a) and (b), and carried out opening only of the edge. Anythings are possible if the thickness of the exit cone of a core and an edge is adjusted to flowing of reactant gas in short using an experiment, a computer simulation, etc. so that a vertical distribution can be made uniform. Actually, when a **** experiment is conducted using the gas inlet of drawing 3 and drawing 4 , it turns out that the almost same distribution as the above-mentioned example is obtained so that drawing 5 may see.
[0015]
[Effect of the invention] Since a vertical thickness distribution is controllable according to this invention free to flowing of reactant gas by having changed the thickness of the blow-off width of face of a gas inlet by the location as explained above, it is

compact and the photon assisted CVD system of a low cost can be obtained.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the invention] Since a vertical thickness distribution is controllable according to this invention free to flowing of reactant gas by having changed the thickness of the blow-off width of face of a gas inlet by the location as explained above, it is compact and the photon assisted CVD system of a low cost can be obtained.

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Object of the Invention] By using the photon assisted CVD system constituted as mentioned above, **5% of a good thickness distribution can be obtained now in the all field in a 6 inch substrate. However, in order to obtain such a good thickness distribution, the reactant gas introduction opening with the blow-off width of face more than the length to which the diameter of a substrate is received is needed. Drawing 9 shows a vertical thickness distribution to flowing when ****ing to a substrate diameter using the gas inlet which had one 1.6 times [1.1 times, 1.3 times, and] the blow-off width of face of this, respectively in **** which used the 6 inch substrate. In the circumference section of a substrate, the thickness is falling [blow-off width of face] extremely the parvus case so that drawing 9 may see. On the other hand, in connection with the increase in blow-off width of face, it turns out that the thickness fall of the circumference section is improved. Since flowing of the reactant gas which blows off from blow-off width of face blows off at the edge of an exit cone 5 rather than is uniform and the amount is falling, this is considered.

[0007] Therefore, if it is going to deposit a uniform layer on a large area substrate using the photon assisted CVD system constituted as mentioned above, it is necessary to use the gas inlet with one a minimum of 1.6 times the blow-off width of face of this to a substrate diameter. However, when doing in this way, there was a trouble where would lead to large-sized-izing of equipment or large flow rate-ization of reactant gas from the viewpoint of equipment production, as a result high cost-ization would be caused.

[0008] this invention solves the above troubles, and it is compact and it aims at offering the diameter substrate correspondence photon assisted CVD system of the macrostomia of a low cost.

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CLAIMS

[Claim]
[Claim 1] The exhaust port and the exhaust air means of exhausting the gas inlet and the introduced gas for introducing reactant gas in the reaction chamber in which a substrate is held, and this reaction chamber, Between the light source room in which the light source and this light source for carrying out photochemical reaction of this reactant gas, and making a thin film form on this substrate are held, and this reaction chamber and this light source room Arrange the blow-of-gas plate of light-transmission nature with many stomas, and the 1st gas style is introduced in the shape of a sheet from this gas inlet almost in parallel with the front face of the substrate held in this reaction chamber. Moreover, the 2nd gas style is introduced into the front face on this substrate from orientation perpendicular to this front face from the blow-of-gas plate of light-transmission nature with the stoma of these masses. The photon assisted CVD system characterized by making adjustable thickness of the blow-off width of face of the 1st above-mentioned gas inlet in the photon assisted CVD system which held the gas style of the above 1st in the laminar-flow status near the front face of this substrate.

[Translation done.]